11.7–25 INFLUENCE OF MINUTE CRYSTAL STRAIN-FIELDS ON LAUE CASE ROCKING CURVES: A THEORETICAL STUDY. By R.Teworte

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Laue case rocking curves of a pair of highly perfect crystals display a detailed fine structure in the low-absorption case ($\mu_0 \cdot t \leq 2$, μ_0: absorption coefficient, t: crystal thickness). The precise shape of the oscillations on the wings of the rocking curves depends very sensitively on the scattering factor of the crystal atoms, thus allowing measurements of the structure factor of silicon with uncertainties well below 0.1% (Teworte & Bonse, 1984).

In this context, the question of the influence of minute residual strain in the crystal on the shape of the rocking curve is discussed. In incident-spherical-wave approximation, beam paths and phase integrals are numerically computed on the basis of the ray optical theory in the form given by Bonse (1964). Rocking curves of pairs of crystals with built in $\frac{\Delta d}{d}$ fluctuations and local lattice rotations are presented. An example is shown in Fig. 1. The influence of strainfields on the precision of the structure factor measurements is discussed and limits of such measurements for a given crystal perfection are deduced.

References: U.Bonse, Z.Phys. 177,385(1964)
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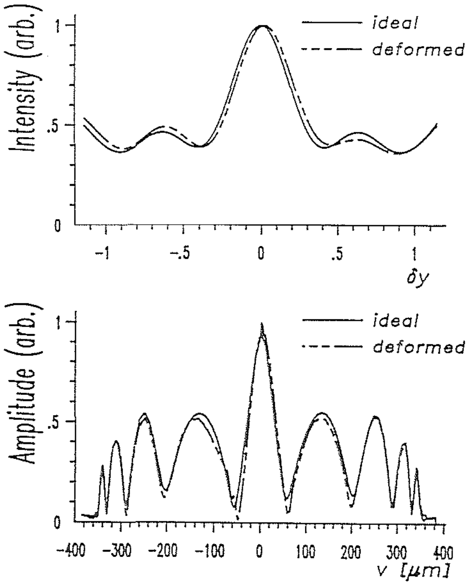

Fig.1 Rocking curve (top) and intensity distribution at the exit surface for y=0.24 (bottom) of ideal and deformed crystals. Si 555-reflection, λ=0.559 Å. Crystal thickness is 350 μm. The deformation state is given by $NN=2\times10^{-10}\mu m^{-1} \times \sin(0.025 \times v[\mu m])$.

11.7–26 PRIMARY EXTINCTION IN SPHERICAL CRYSTALS. By T.M. Sabine,

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The extinction factor appropriate to perfect crystal spheres is found to be

$$y = (1+x^2)^{-\frac{1}{2}}$$

$$x = \frac{3}{4} N_c \lambda F D$$

N_c = Number of unit cells per unit volume
λ = Wavelength
D = Crystal diameter
F = Structure factor per unit cell and includes the Debye-Waller factor.

Experimental tests of the validity of this expression have been made using MgO powders of controlled grain size and shape. Two diffraction geometries have been used; fixed wavelength, variable 2θ, at the HIFAR reactor and variable wavelength, fixed 2θ at IPNS. Experimental extinction factors are obtained by taking ratios of integrated intensities (assuming that extinction is negligible for grain sizes <1μm).
Theoretical extinction factors are obtained by a determination of D by scanning electron microscopy and the use of the known crystallographic parameters of MgO. There are no adjustable parameters. Theory and experiment are compared in this paper.

11.7–27 A QUANTITATIVE STUDY OF FADING PHENOMENON OF PENDELLÖSUNG FRINGES IN CRYSTALS. By S. S. Jiang,

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The fading phenomenon of pendellösung fringes in diamond crystals has been studied by x-ray diffraction section topography. The fading periods of dynamical interference fringes have been observed in plate- like crystals and wedge-shaped crystals, as well as in crystals containing a stacking fault. In case of plate-like crystals, the number of fringes in each fading period observed in ($\bar{1}1\bar{1}$) section topograph with Cu radiation is approximately equal to 3.08 which is what we calculated. In case of wedge-shaped crystals, the fading phenomenon of hook-shaped fringes can be seen in ($\bar{2}20$) section topograph with Mo radiation (Fig.1). On the other hand, the hyperbolae of constant phase in Borrmann fan is simulated by computer according to dynamical diffraction theory, in which both π and σ polarization state are overlaped. Evidently, the number of fading period is nearly the same for both experimental results and theoretical simulation. In case of crystals containing a stacking fault, hour glass image is dominated by I_3 fringes in ($\bar{1}1\bar{1}$)